

IN THE CLAIMS:

Please amend claims 1-11, 14, 16-18, 20, and 21, cancel claim 19 without disclaimer or prejudice, and add new claims 22-29, as follows.

1. (Currently Amended) A method of synchronizing with a pattern sequence, the method comprising:

~~performing a first calculation~~ ~~correlation step of~~ calculating a complex product of two adjacent correlating symbols of a first pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a first differential phase information sequence;

~~performing a second calculation~~ ~~correlation step of~~ calculating a complex product of two adjacent correlating symbols of a second pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a second differential phase information sequence;

~~a third correlation step of~~ correlating the first and second differential phase information sequences, thereby obtaining a correlation result; and

~~a step of determining a synchronization between the first and second pattern sequences based on the basis of the obtained correlation result.~~

2. (Currently Amended) The method according to claim 1, wherein

in the first ~~calculation correlation step~~ a predetermined number Z of symbols of the first pattern sequence are used ~~correlated-two~~ at a time to calculate the complex product;

in the second ~~calculation correlation step~~ Z symbols 1 to Z of the second pattern sequence are used ~~correlated-two~~ at a time to calculate the complex product; and

the second ~~calculation~~ and ~~third correlation steps~~ are repeated and wherein, for each repetition m in the second ~~calculation correlation step~~, the predetermined number Z of symbols is shifted by one symbol so that Z symbols $1+m$ to $Z+m$ of the second pattern sequence are used ~~correlated-two~~ at a time to calculate the complex product.

3. (Currently Amended) The method according to claim 1, wherein phase information due to a mismatch of frequency information between the symbols of the first pattern sequence and the symbols of the second pattern sequence is detected based on the ~~basis of the correlation result~~.

4. (Currently Amended) The method according to claim 1, wherein the symbols of the second pattern sequence are contained in a data symbol stream and are modulated in a different way from the data symbols in the data symbol stream, and wherein the method further comprises:

~~a step of detecting the symbols of the second pattern sequence in the data symbol stream~~ based on the ~~basis of the different modulation~~.

5. (Currently Amended) The method according to claim 1, wherein, in the determining-step, the second pattern sequence is received by a receiving device from a transmitting device, and the first pattern sequence forms at least a part of the second pattern sequence and is stored in the receiving device.

6. (Currently Amended) The method according to claim 1, wherein, in the determining-step, the second pattern sequence comprises a sequence of IQ pilot symbols which are contained in a received data symbol stream and the first pattern sequence comprises a reference pattern sequence of IQ pilot symbols.

7. (Currently Amended) The method according to claim 6, wherein, in the determining-step, the IQ pilot symbols comprise quadrature phase shift keying (QPSK) modulated symbols, and the IQ pilot symbols of the second pattern sequence are periodically inserted into the data symbol stream at the transmitting device.

8. (Currently Amended) The method according to claim 1, wherein, in the determining-step, the second pattern sequence comprises a training sequence.

9. (Currently Amended) An apparatus for synchronizing with a pattern sequence, the apparatus comprising:

~~first correlation~~ means for ~~correlating~~ calculating a complex product of two adjacent symbols of a first pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

~~second correlation~~ means for ~~correlating~~ calculating a complex product of two adjacent symbols of a second pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

~~third correlation~~ means for correlating the first and second differential phase information sequences, and outputting a correlation result; and

means for determining a synchronization between the first and second pattern sequences based on ~~the basis of~~ the correlation result.

10. (Currently Amended) The apparatus according to claim 9, wherein

the first ~~correlation~~ means are ~~arranged~~ configured to ~~correlate~~ calculate the complex product for a predetermined number Z of symbols of the first pattern sequence two at a time;

the second ~~correlation~~ means are ~~arranged~~ configured to ~~correlate~~ calculate the complex product for Z symbols 1 to Z of the second pattern sequence two at a time; and

the second and third ~~correlation~~ means are ~~arranged~~ configured to repeat the ~~correlation~~ operations; the apparatus further comprising:

shifting means for shifting, for each repetition m , the predetermined number Z of symbols in the second ~~correlation~~ means by one symbol so that Z symbols $1+m$ to $Z+m$

of the second pattern sequence are used ~~correlated~~ two at a time for calculating the complex product.

11. (Currently Amended) The apparatus according to claim 9, further comprising:

means for detecting phase information due to a mismatch of frequency information between the symbols of the first pattern sequence and the symbols of the second pattern sequence from the correlation result output by the third ~~correlation~~ means.

12. (Original) The apparatus according to claim 9, further comprising:
storing means for storing the first pattern sequence.

13. (Original) The apparatus according to claim 9, further comprising:
means for detecting the symbols of the second pattern sequence in a data symbol stream.

14. (Currently Amended) A system for synchronizing with a pattern sequence, the system comprising:

a transmitting device which includes:

means for generating symbols of a pattern sequence to be used for synchronization; and

transmitting means for transmitting the symbols of the pattern sequence;

and a receiving device which includes:

~~first correlation~~ means for ~~correlating~~ calculating a complex product of two adjacent symbols of a reference pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

receiving means for receiving the symbols of the pattern sequence transmitted by the transmitting device;

~~second correlation~~ means for ~~correlating the~~ calculating a complex product of two adjacent received symbols of the pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

~~third correlation~~ means for correlating the first and second differential phase information sequences, and outputting a correlation result; and

means for determining a synchronization between the received and reference pattern sequences based on ~~the basis of~~ the correlation result.

15. (Original) The system according to claim 14, said transmitting device further comprising:

first modulation means for modulating data of the pattern sequence to be used for synchronization, according to a first modulation scheme, thereby providing the symbols of the pattern sequence;

second modulation means for modulating payload data according to a second modulation scheme, thereby providing a data symbol stream; and

means for inserting the symbols of the pattern sequence into the data symbol stream.

16. (Currently Amended) The system according to claim 15, wherein the first modulation means are ~~arranged~~ configured to modulate the data of the pattern sequence according to quadrature phase shift keying (QPSK) modulation scheme, and the second modulation means are arranged to modulate the payload data quadrature amplitude modulation (QAM) or Trellis coded modulation (TCM) modulation scheme.

17. (Currently Amended) The system according to claim 15, wherein the inserting means are arranged to insert the quadrature phase shift keying (QPSK) modulated symbols periodically into the quadrature amplitude modulation (QAM) or Trellis coded modulation (TCM) modulated data symbol stream.

18. (Currently Amended) A computer program embodied on a computer readable medium~~product~~, comprising software code portions for performing a method ~~when the product is run on a computer, the method comprising:~~

a first ~~calculation~~correlation step of correlating ~~calculating a complex product of~~
two adjacent symbols of a first pattern sequence, the symbols comprising amplitude and
phase information, thereby obtaining a first differential phase information sequence;

a second ~~calculation~~correlation step of correlating ~~calculating a complex product~~
of two adjacent symbols of a second pattern sequence, the symbols comprising amplitude
and phase information, thereby obtaining a second differential phase information
sequence;

~~a third correlation step of correlating~~ the first and second differential phase
information sequences, thereby obtaining a correlation result; and

~~a step of determining a synchronization between the first and second pattern~~
sequences based on the basis of the obtained correlation result.

19. (Cancelled)

20. (Currently Amended) The computer program ~~product~~ according to claim
18, wherein said computer ~~program product~~ readable medium is directly loadable into the
internal memory of the computer.

21. (Currently Amended) A system for synchronizing with a pattern sequence,
the system comprising:

a transmitting device which includes:

a symbol generator ~~for generating~~ configured to generate symbols of a pattern sequence to be used for synchronization; and

a transmitter ~~for transmitting the~~ configured to transmit symbols of the pattern sequence;

and a receiving device which includes:

a first processor ~~for correlating~~ configured to calculate a complex product of two adjacent symbols of a reference pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

a receiver for receiving the symbols of the pattern sequence transmitted by the transmitting device;

a second processor ~~for correlating~~ configured to calculate a complex product of two adjacent ~~the~~ received symbols of the pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

a third processor for correlating the first and second differential phase information sequences, and outputting a correlation result; and

a fourth processor for determining a synchronization between the received and reference pattern sequences based on ~~the basis of~~ the correlation result.

22. (New) The system according to claim 21, said transmitter further comprising:

first modulator configured to modulate data of the pattern sequence to be used for synchronization, according to a first modulation scheme, and provide the symbols of the pattern sequence;

second modulator configured to modulate payload data according to a second modulation scheme, and provide a data symbol stream; and

an insertion unit configured to insert the symbols of the pattern sequence into the data symbol stream.

23. (New) The system according to claim 21, wherein the first modulator is configured to modulate the data of the pattern sequence according to quadrature phase shift keying (QPSK) modulation scheme, and the second modulator is configured to modulate the payload data quadrature amplitude modulation (QAM) or Trellis coded modulation (TCM) modulation scheme.

24. (New) The system according to claim 21, wherein the insertion unit is configured to insert the quadrature phase shift keying (QPSK) modulated symbols periodically into the quadrature amplitude modulation (QAM) or Trellis (TCM) modulated data symbol stream.

25. (New) An apparatus for synchronizing with a pattern sequence, the apparatus comprising:

first calculation unit configured to calculate a complex product of two adjacent symbols of a first pattern sequence, the symbols comprising amplitude and phase information, and output a first differential phase information sequence;

second calculation unit configured to calculate symbols of a second pattern sequence, the symbols comprising amplitude and phase information, and output a second differential phase information sequence;

correlation unit configured to correlate the first and second differential phase information sequences, and output a correlation result; and

determination unit configured to determine a synchronization between the first and second pattern sequences based on the correlation result.

26. (New) The apparatus according to claim 25, wherein

the first calculation unit is configured to calculate the complex product for a predetermined number Z of symbols of the first pattern sequence two at a time;

the second calculation unit is configured to calculate the complex product for Z symbols 1 to Z of the second pattern sequence two at a time; and

the second calculation and correlation units are configured to repeat the operations; the apparatus further comprising:

shifter unit, configured to shift for each repetition m , the predetermined number Z of symbols in the second calculation unit by one symbol so that Z symbols $1+m$ to $Z+m$ of the second pattern sequence are correlated two at a time.

27. (New) The apparatus according to claim 25, further comprising:

detecting unit configured to detect phase information due to a mismatch of frequency information between the symbols of the first pattern sequence and the symbols of the second pattern sequence from the correlation result output by the correlation unit.

28. (New) The apparatus according to claim 25, further comprising:

Storage unit configured to store the first pattern sequence.

29. (New) The apparatus according to claim 25, further comprising:

a detector unit configured to detect the symbols of the second pattern sequence in a data symbol stream.